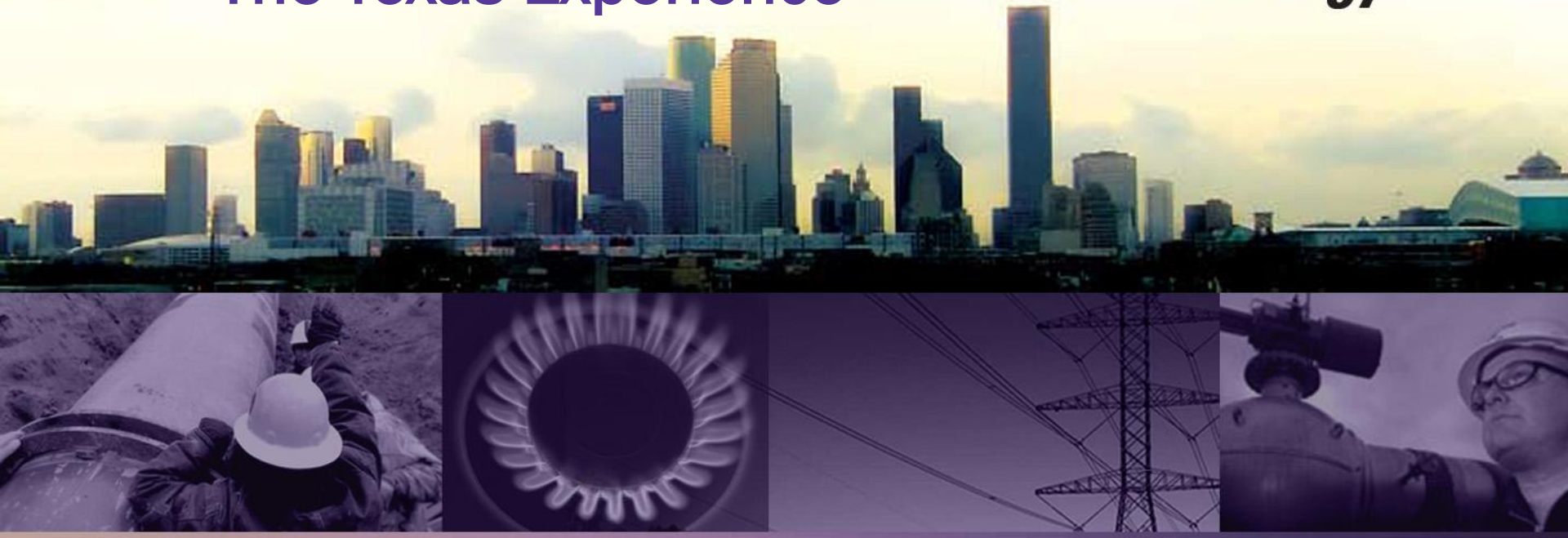
Smart Grid

The Texas Experience



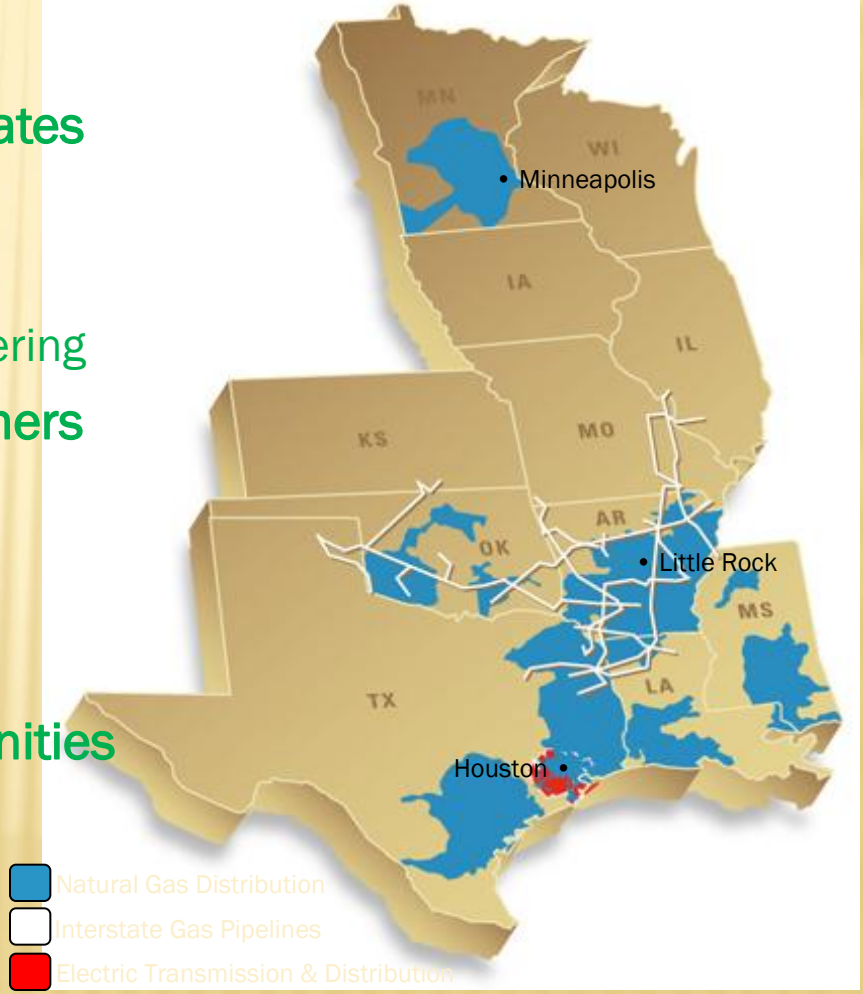
CenterPoint Energy

Robert B. Frazier

Director of Electric Technology

WHO IS CENTERPOINT ENERGY?

- Public company traded on the New York Stock Exchange (CNP)
- Headquartered in Houston, TX
- Operating 6 business segments in six states
  - Electric transmission and distribution
  - Natural gas distribution
  - Interstate pipelines and natural gas gathering
- Serving 5.4 million electric & gas customers
- $22 billion in assets
- $8.5 billion in revenue
- Approximately 9,000 employees
- Over 130 years of service to our communities



"To be recognized as America's Leading Energy Delivery Company… and more"

WHO IS CENTERPOINT ENERGY – ELECTRIC?

Houston Electric Division (CEHE)
Houston (4th largest city in the US)
Houston Metro Area (6th largest in US)

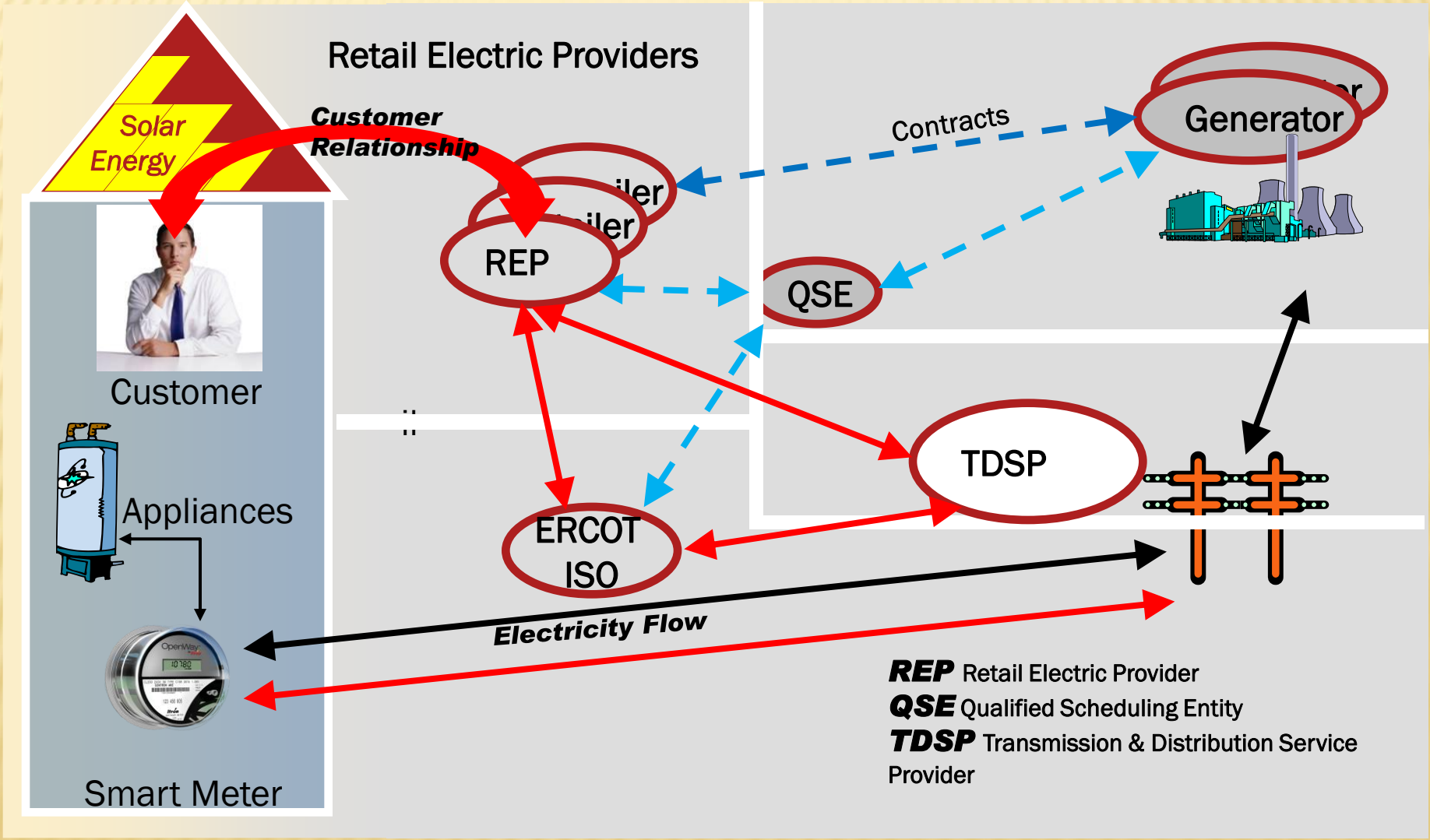
- 5,000 square mile service area
- Greater than 2.2 million electric meters
- Houston Electric
  - Delivers17.3 peak and 77 Gigawatt hours annually for about 115 certified Retail Electric Providers
  - Transmission and Distribution System
    - 3,742 miles of transmission lines
    - 48,733 miles of distribution lines
    - 233 substations

Electric Challenge:

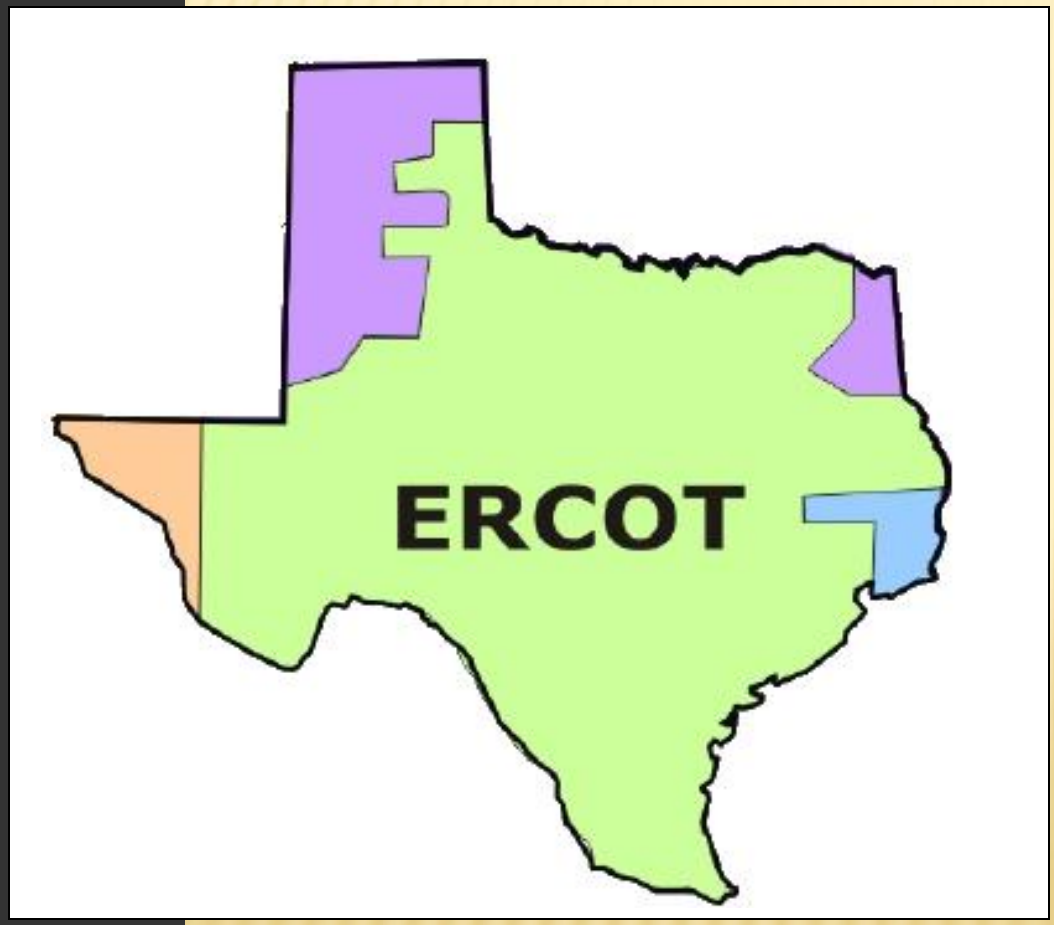
Effectively monitor and control millions of meters, line devices and miles of delivery wire which, if laid end to end, almost circle the earth twice around the equator

SEE ELECTRICITY IN A WHOLE NEW LIGHT

THE TEXAS ELECTRIC MARKET
DEREGULATED SINCE JANUARY 2002



Texas Electric Market is ERCOT
(Electric Reliability Council of Texas)



115 Retail Electric Providers

Direct Energy

Reliant Energy

TXU Energy

Transmission and Distribution Utilities

AEP TEXAS
A unit of American Electric Power

CenterPoint Energy

ONCOR

TNMP

Generation Companies

EnergyCo, LLC

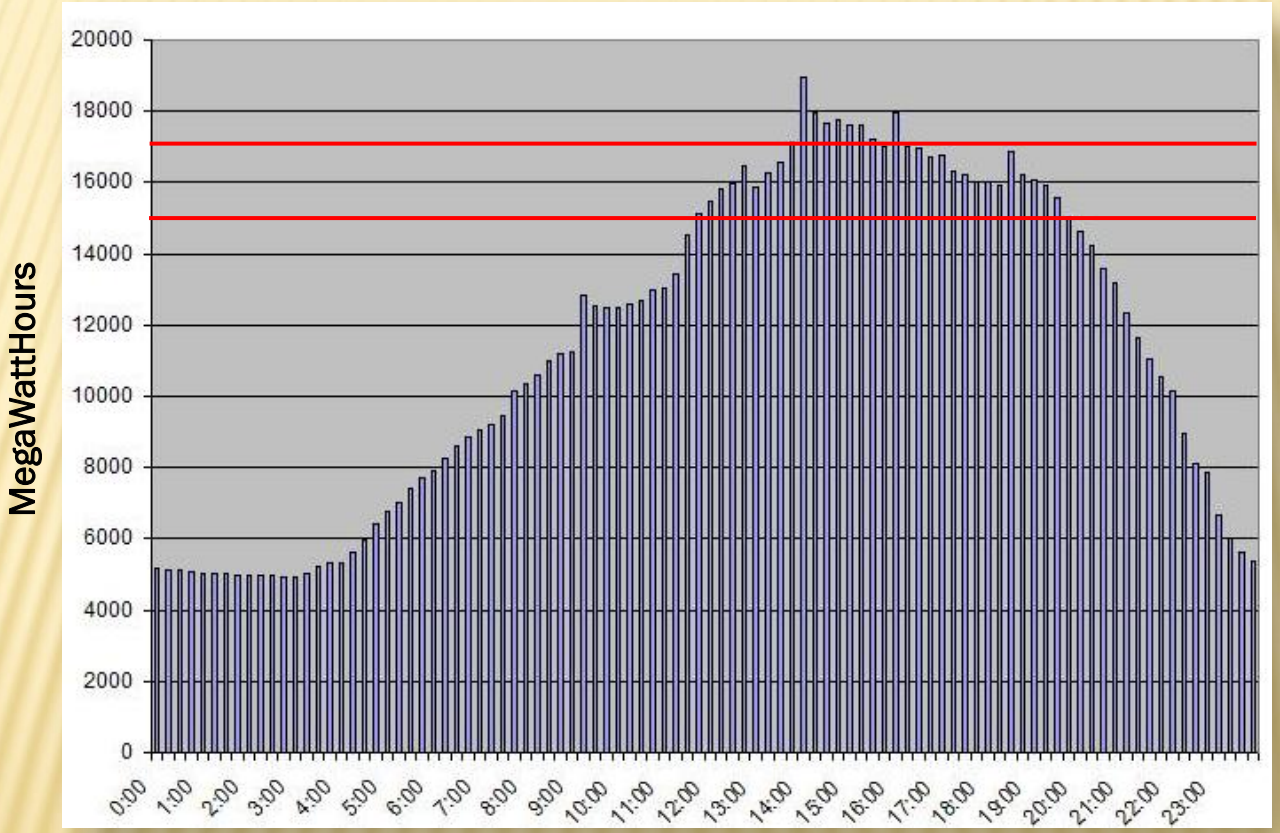
Exelon Generation

Luminant

NRG

TYPICAL LOADSHAPE IN NATIONAL ENERGY MARKET

Eliminating demand peaks through Demand Response



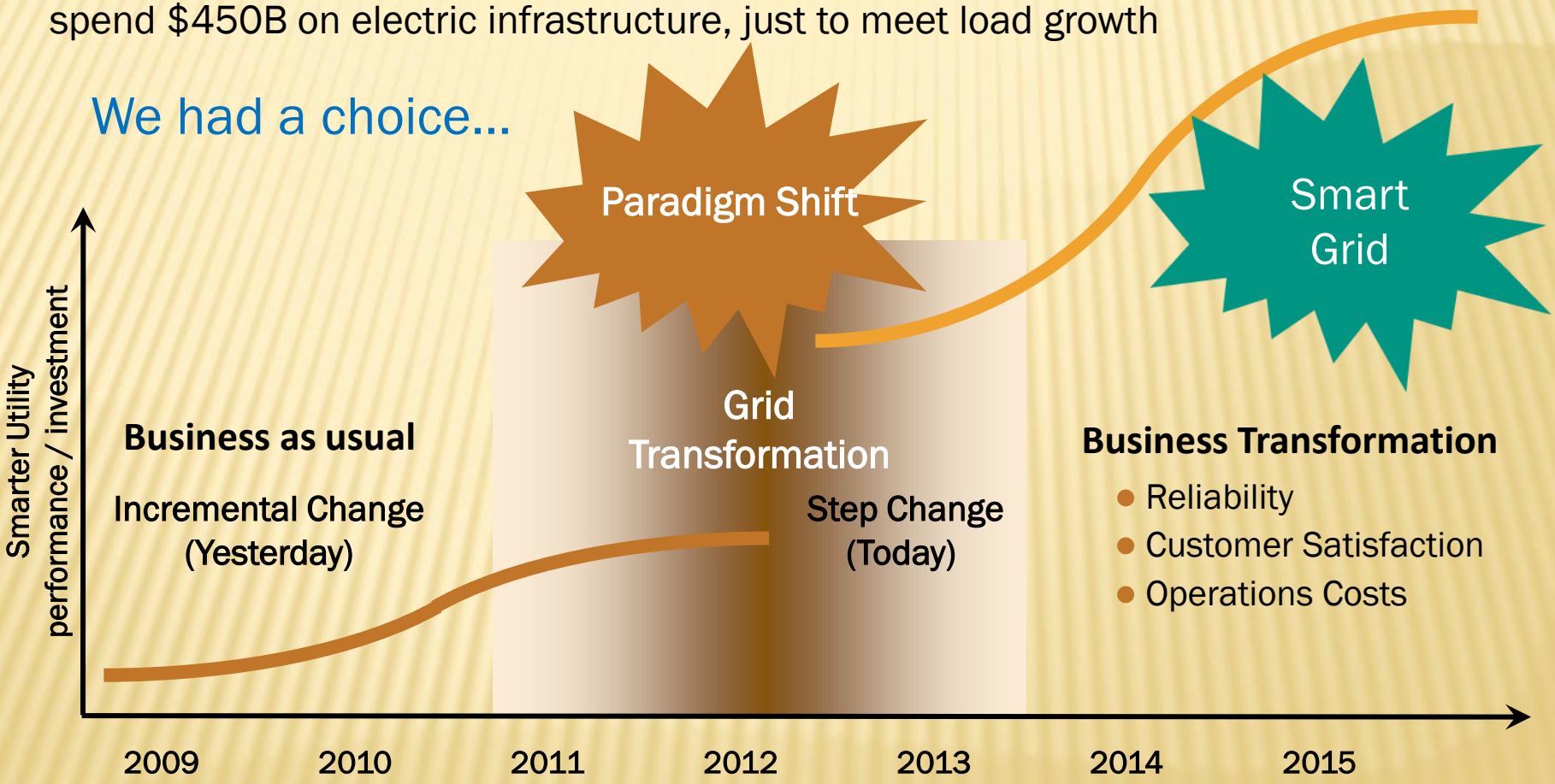
Day Time; quarter hourly readings

BUSINESS TRANSFORMATION OPPORTUNITY
UTILITIES AT A CROSSROADS …

CenterPoint Energy

According to the DOE Grid 2030 report, in the next 20 years, the U.S. will spend $450B on electric infrastructure, just to meet load growth

We had a choice…



TEXAS POLICY

HB 2129 (79th R)

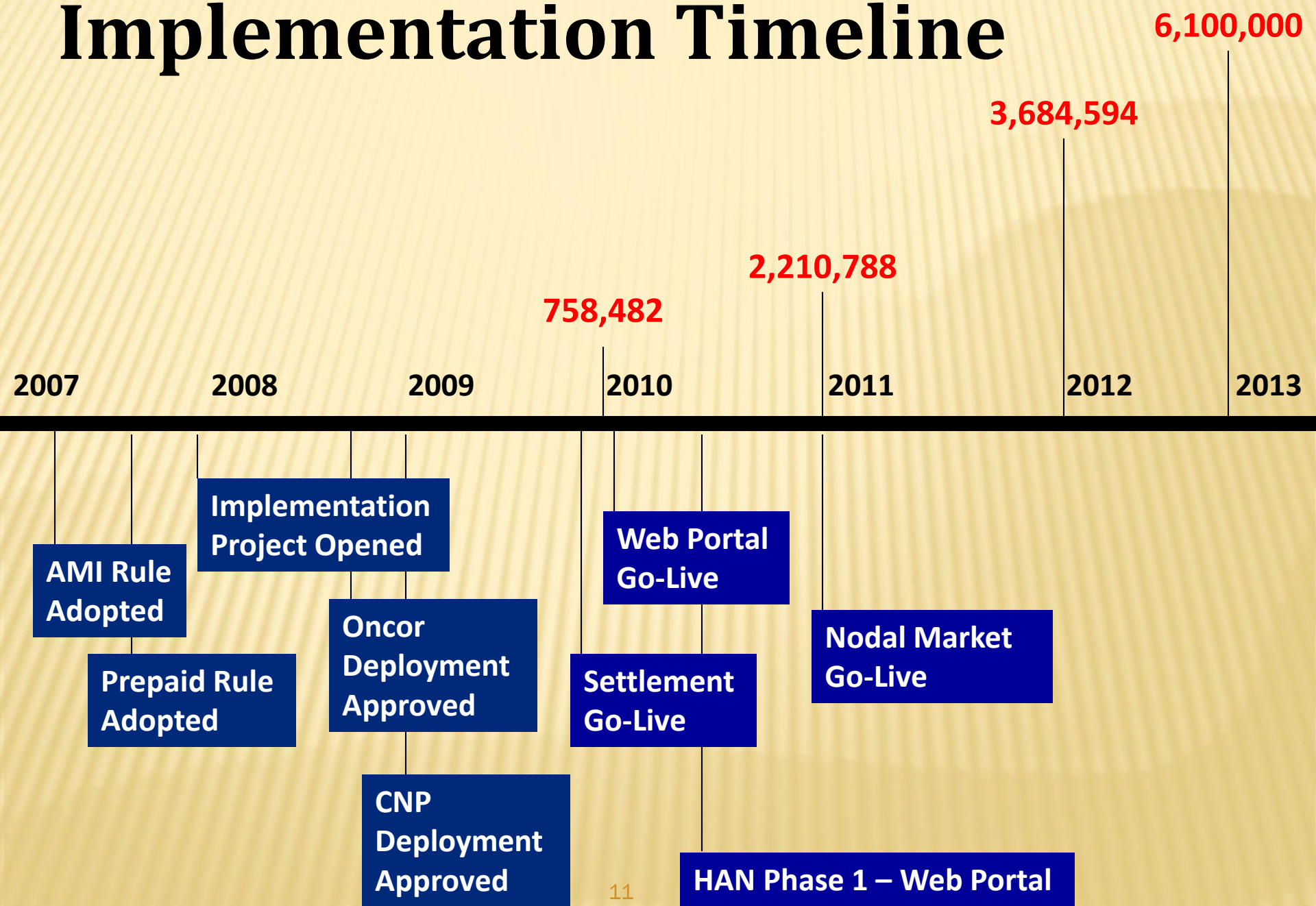
"In recognition that …new metering and meter information technologies, have the potential to increase the reliability of the regional electrical network, encourage dynamic pricing and demand response, make better use of transmission and generation assets, and provide more choices for consumers, the legislature encourages the adoption of these technologies by electric utilities in this state."

TEXAS POLICY

Passage of HB 3693 (80th R)

- Expressed the intent of the legislature that net metering and "advanced meter data networks be deployed as rapidly as possible."

Implementation Timeline



CNP'S VISION FOR THE SMART GRID

1. Advance Metering Systems (AMS)

- AMS will provide

1. Detailed information on usage,
2. Significantly faster and less intrusive service for reads,
3. Faster remote turn on/off,
4. Meter checks for functionality working, removal, tilt
5. Two-way communication between customers and market participants (i.e., REP, QSE, Aggregators, Authorized 3rd Parties, and TDSPs)
6. Back office systems to analyze, retry for missing, estimate accurately, prepare for the market
7. Everyman's portal to access the data

Cost: 2.2 Million Advanced Meter System (AMS) meters to be installed during 2010 - 2012 at a cost of $580 million

METER FUNCTIONALITY AND INSTALLATION

1. Meter Functionality

1. Detailed variable interval usage data (TX selected 15 min)
2. Remote off / on for 200 amp
3. On board usage storage of up to 60 days
4. Power out remote notification (last gasp)
5. ZigBee enabled for Home Area Network (HAN) devices
6. Mesh communication between meters

2. Installation Opportunity

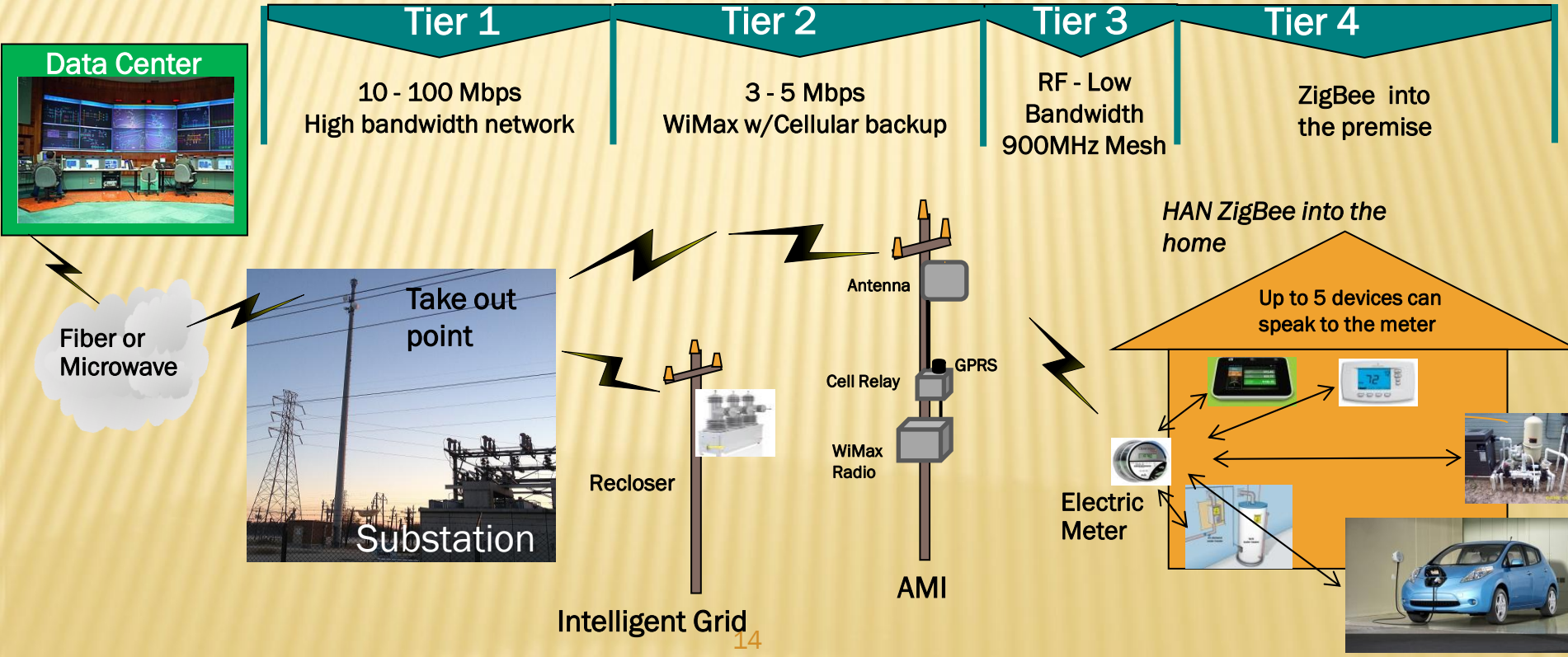
1. Knock and inform customer before pulling meter
2. Visit all meters by trained crew, not just readers
3. Check for safety issues (weather head loose, vegetation, etc)
4. Check for obvious signs of diversion
5. Take a picture of existing and any unusual conditions
6. Take an lat/long fix on the meter location
7. Leave a door hanger explaining program

SMART GRID COMMUNICATION NETWORK

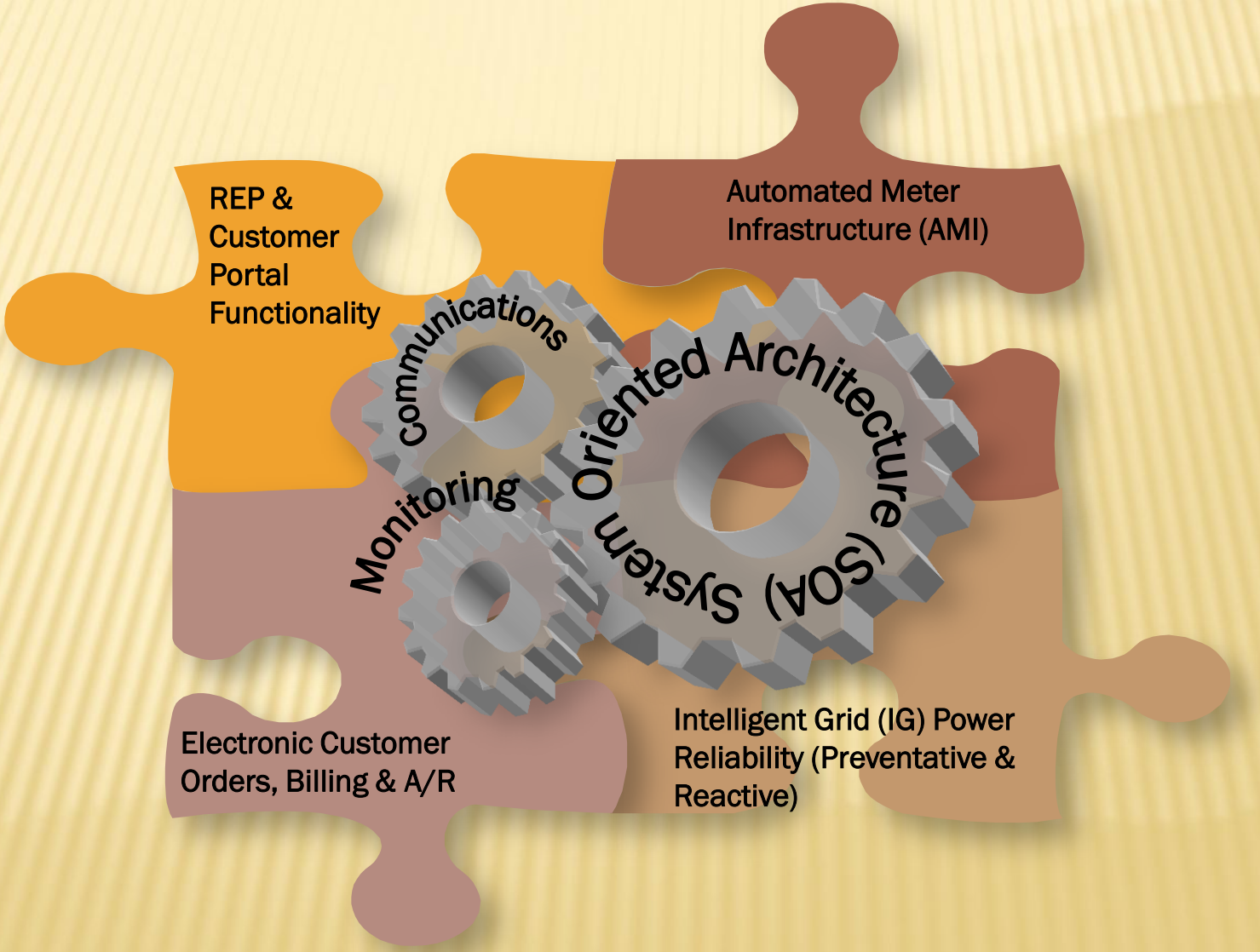
The communications network can be segregated into four distinct segments

- Tier 1 - High Speed: Data Center to the substations (Take Out Points)
- Tier 2 - Utility Grade Speed: Substations to the remote data router
- Tier 3 - Radio Wireless: Remote data router to the meter (1 to 400 ratio)
- Tier 4 - Meter to HAN via ZigBee: wireless to Home Area Network (HAN) devices

Two-Way Communication



SYSTEMS AND ARCHITECTURE TO SUPPORT CNP'S DISTRIBUTION AUTOMATION STRATEGY



CONTINUOUS IMPROVEMENT

July 2012

INFRASTRUCTURE DEPLOYMENT

Take out Points – Installed 140

Cell Relays – 5,391

Meters Deployed – 2,232,278

- Number of HAN devices provisioned – 9,576
- Meter Hardware Standardization – Version 2.0
- Meter Firmware Standardization – Version 3.0

READ RATE PERFORMANCE

Register and 15 minute Intervals

- 3 times per day

1st attempt (98.43% and improving)

- Bulk within 4 hours
- P2P for 3 more hours

Retry for 5 Days (99.9%)

PROGRAM STATISTICS

Cycle Bills produced via AMS reads – 16,401,141

Total Service Orders Complete – 3,364,070 (97.0%)

Service Orders for 2012 – 1,935,883 (98.0%)

- Reconnect – 22 mins (Firewall to meter)
- Turn On Orders ~12-16 mins (MDM to meter)

July 2013

INFRASTRUCTURE DEPLOYMENT

Take out Points – Installed 146

Cell Relays – 5,491

Meters Deployed – 2,268,395

Range Extenders: 1761

- Number of HAN devices provisioned – 6,422
- Meter Hardware Standardization – Version 3.0
- Meter Firmware Standardization – Version 3.7

READ RATE PERFORMANCE

Register and 15 minute Intervals

- 3 times per day

1st attempt (99.61%)

- Bulk within 4 hours
- Point to Point for 3 more hours

Retry for 5 Days (99.9%)

PROGRAM STATISTICS

Cycle Bills produced via AMS reads – 61,499,886

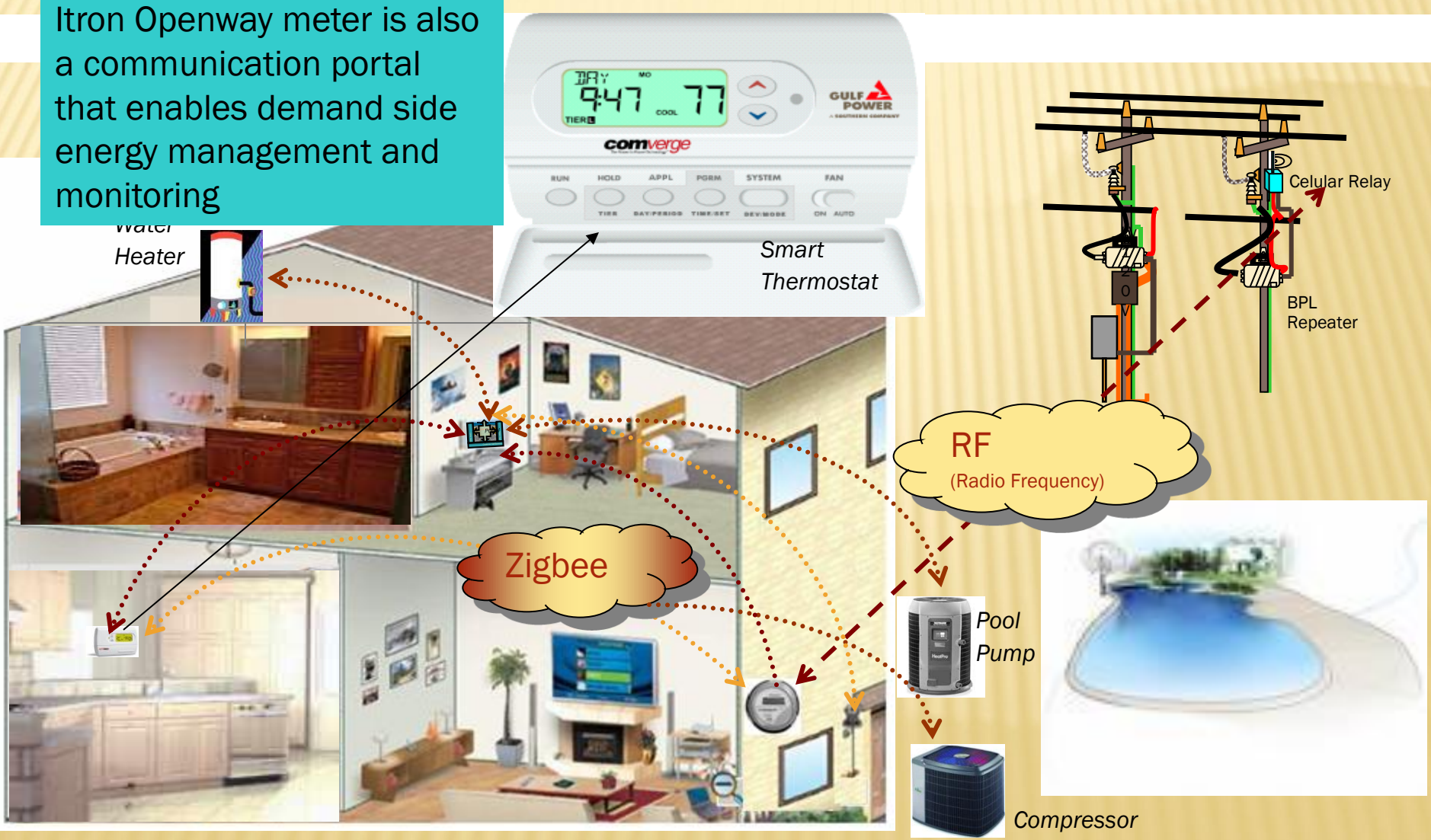
Total Service Orders Complete – 6,050,016 (98.0%)

Service Orders for 2013 – 2,632,639 (99.0%)

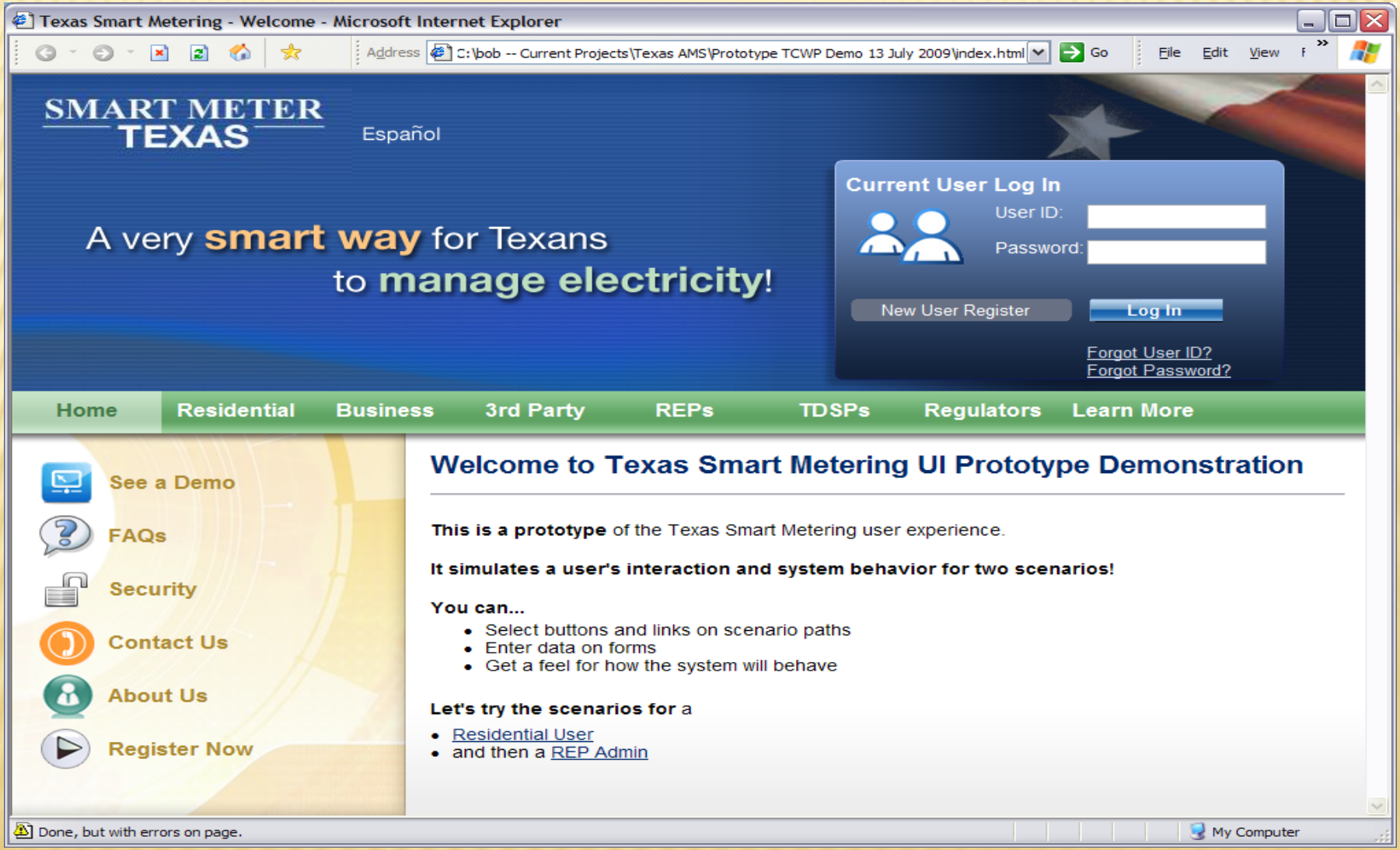
- Reconnect – 14 mins (Firewall to meter)
- Turn On Orders ~11-14 mins (MDM to meter)

CONNECTIVITY METER TO HOME AREA NETWORK (HAN) - ZIGBEE

Itron Openway meter is also a communication portal that enables demand side energy management and monitoring



SMARTMETERTEXAS.COM - AMI PORTAL



SMARTMETERTEXAS.COM (SMT) COMMONE PORTAL TO AMI FOR TEXAS

ADVANCED METERING MARKET PORTAL
SMARTMETERTEXAS.COM

Meter Interval Usage

HAN Messages

Meter Attributes

Customer Premise

Meter Provisioning

Detailed Usage

Demand Response

Settlement

Customer Messaging

CNP'S VISION FOR THE SMART GRID

2. Intelligent Grid (IG)

- Intelligent Grid is comprised of

1. System sensors & monitors,
2. Field communications
3. Data-trending software to provide real-time insight the distribution system
4. Provide greater safety and reliability
5. Provide proactive customer notification of planned and unplanned outages
6. Improve customer satisfaction

Cost: Initial implementation 15% of CNP territory with IG by 2014

INTELLIGENT GRID

What Should We Do?

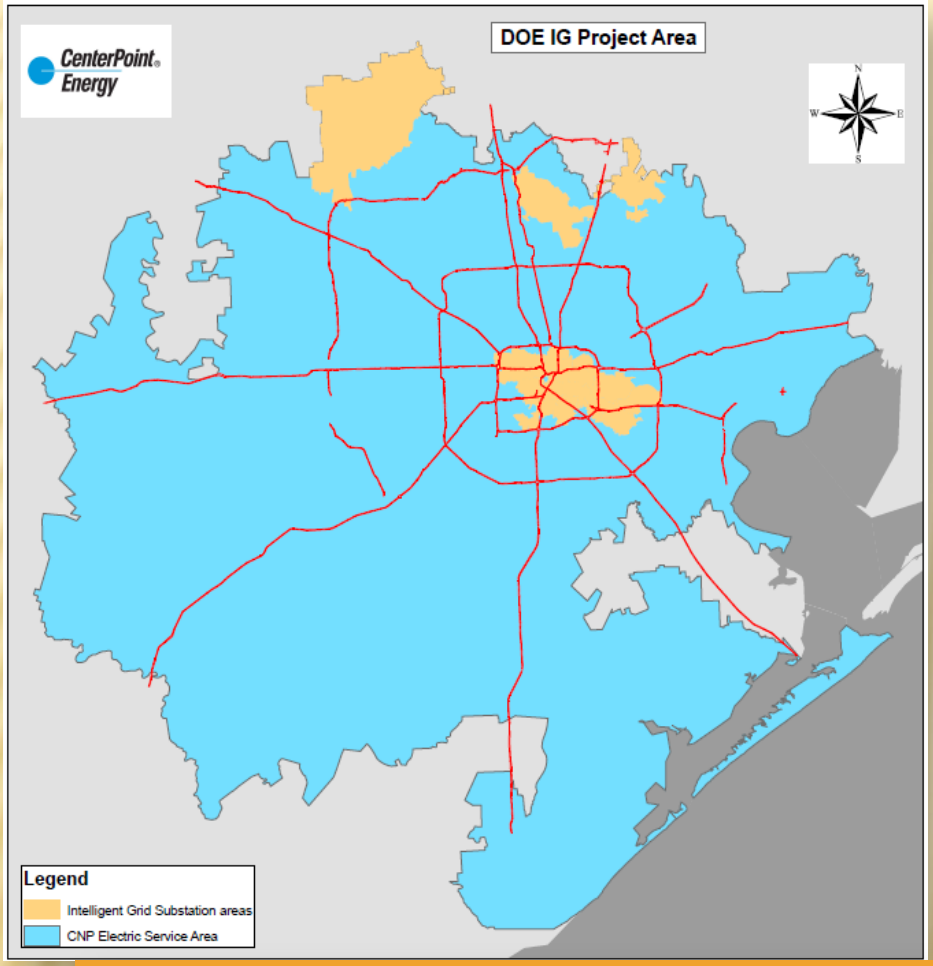
- Goal 1 – Detect fault
- Goal 2 – Isolate the faulted section
- Goal 3 – Locate the cause
- Goal 4 – Characterize fault type
- Goal 5 – Monitor Assets

How do we do it?

with TECHNOLOGY

- Accurate sensing
- High Resolution Event Recording
- Automated Switching Devices
- Remote Control Restoration
- Automated Fault location
- Fault characterization
- IG Self Diagnostics

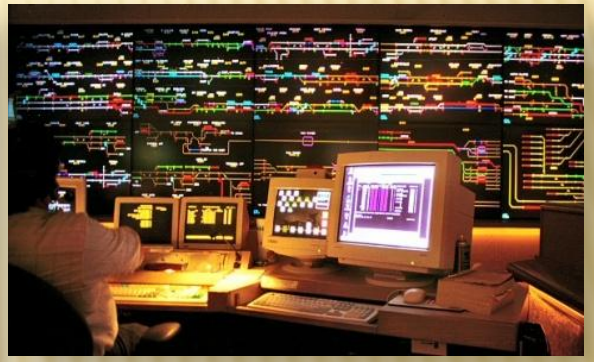
2010-2014 DEPLOYMENT OF THE



- Infrastructure Deployment – YE 2013
  - ≈ 31 Substation Upgrades
  - ≈ 180 Distribution Circuits
  - ≈ 600 Intelligent Grid Switching Devices
  - Multiple Communications Paths
  - ≈ 420K Customers
  - 75% Complete YE 2012
- Advanced Distribution Management System – Fall 2014
  - Replace Legacy OMS, DMS & DSCADA
  - Integration to Upgraded Mobile Work Force Management & Legacy Systems

While this phase covers about 15 percent of CenterPoint Energy's service area, some of the improvements will benefit consumers in the entire system.

SYSTEM DESIGN



Combined with back office computer systems, IG technology, when fully deployed, will automatically identify the location of power outages, isolate faulted sections of the grid and re-route power from other sources, essentially “healing” the system.

2012 CUSTOMER BENEFIT

- During 2012, field switching executed remotely via automation was successfully utilized on 320 outage events impacting 162 circuits
- There are 478,868 customers served by these 162 circuits
- Without the use of automation, these 162 circuits would have experienced 123,645,636 customer outage minutes
- The use of automation avoided 27,111,267 customer outage minutes resulting in an average reliability improvement of 21.9%

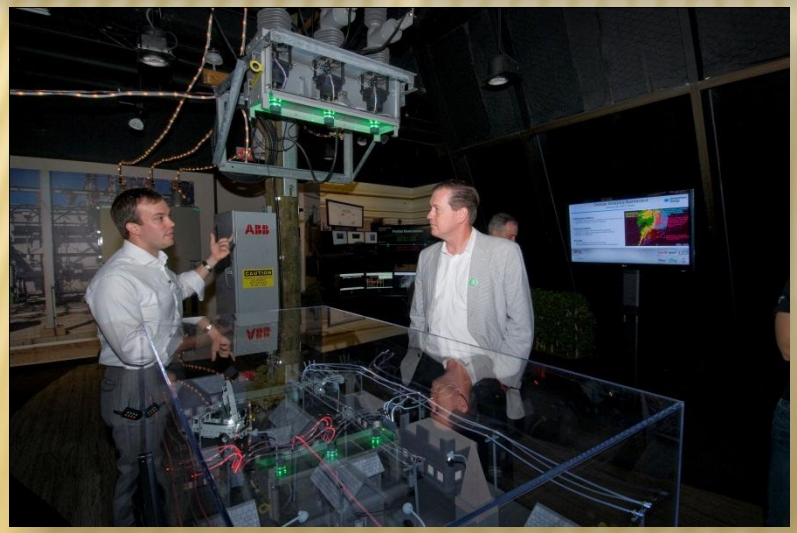
CNP'S VISION FOR THE SMART GRID

CenterPoint Energy's Goal

Enable the Texas electricity market to extract the full value and capabilities of the Smart Grid by:

1. Supporting individual management of electricity consumption and
2. Developing and fostering adoption of market-driven programs and collaborative procedures

DEMONSTRATION CENTER



- Created the Energy InSight Center to create a hands-on experience
  - Create common awareness
  - Educate and understand
  - Collaborate to establish the vision
- Visited by
  - US congressmen,
  - US Senarot Murkowski
  - FERC Chairman
  - Dept of Commerce,
  - TX PUC Commissioners/staff
  - 100 US and foreign utilities
  - Over 600 tours in total

ANALYTICS

Turning Data Into Intelligence Into Actionable Items

ANALYZING MASSIVE AMOUNTS OF DATA

DELIVERING INFORMATION YOU CAN "TRUST"

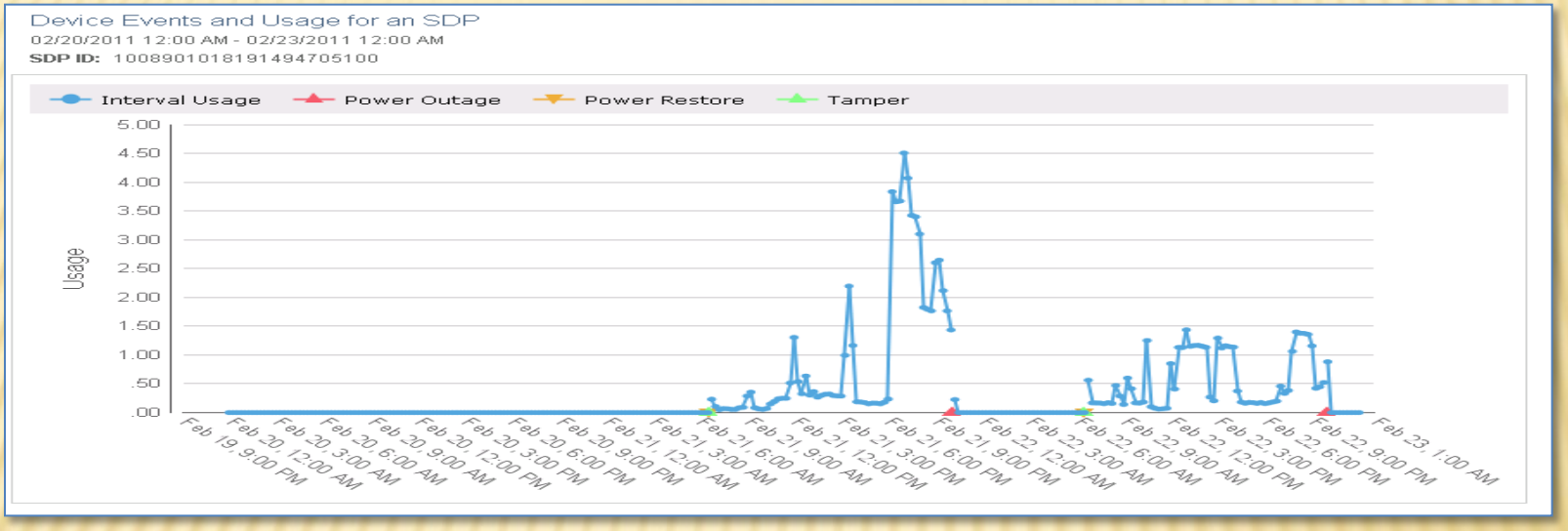
ENABLING EFFICIENT DATA DRIVEN DECISION MAKING

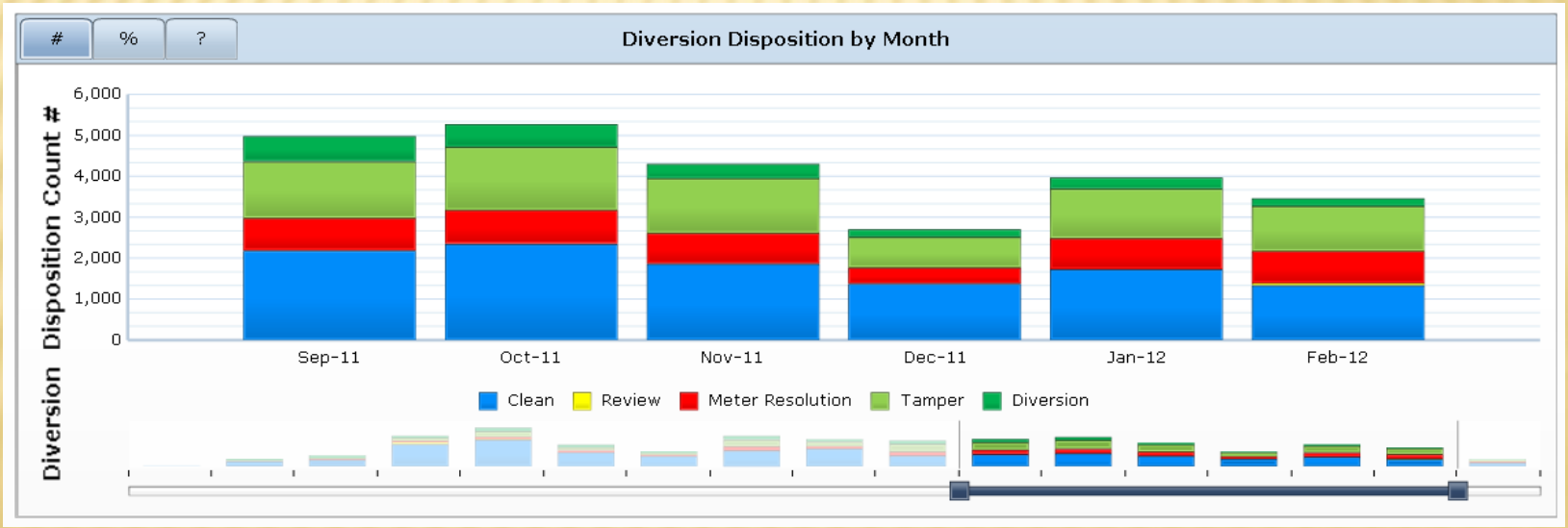
KEEPING ONLY WHAT YOU NEED

Current Analytics Initiatives

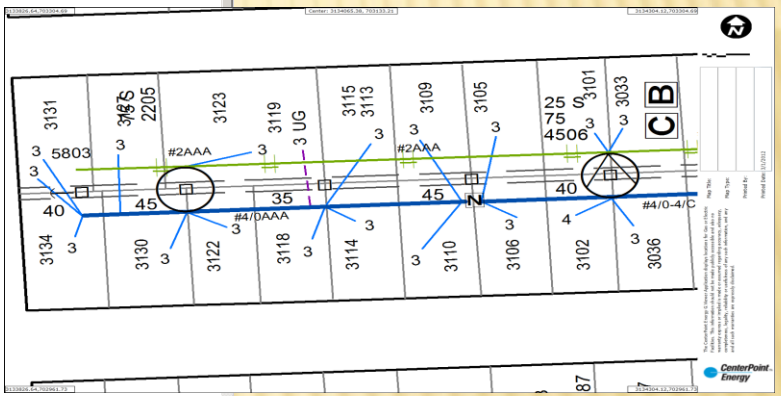
- Diversion Detection and Revenue Protection
- Transformer Load Analysis & Proactive Maintenance
- Financial Month End Revenue Estimation Accuracy
- Outage Analysis and Correlations
- Real-time situational awareness for AMI Communication

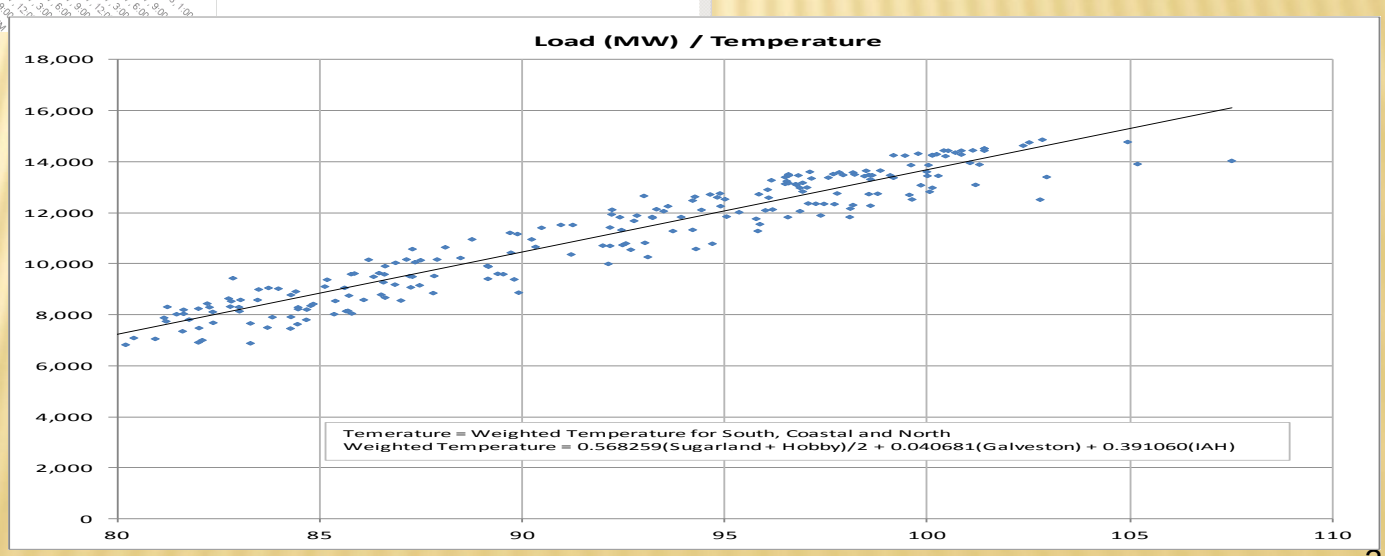
Diversion Detection



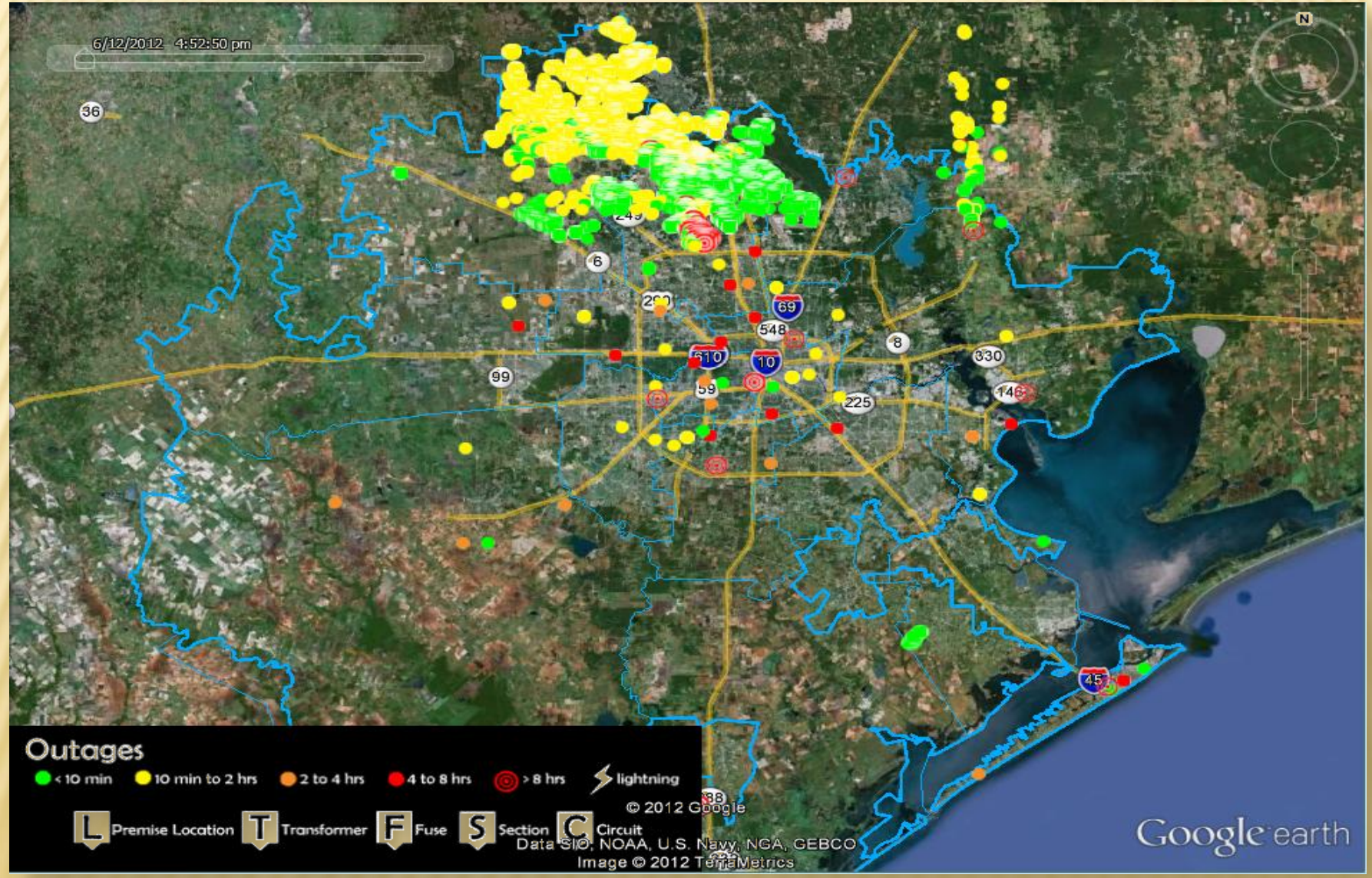


Transformer Load Management and Proactive Maintenance





METER OUTAGE EVENTS WITH NO MATCHING RESTORATION & LENGTH OF OUTAGE



PILOTS FOR ADDITIONAL BENEFIT

- Distribution Transformer Metering
- Automated Streetlight Monitoring and Control
- Load Shed at the Meter
- Automated Phasing Determination
- Multiple other Analytics projects

Thank you
for allowing me to share the
Texas and CenterPoint advanced
metering Smart Grid story

QUESTIONS?

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